

Accutrac 360-t

Operation & Troubleshooting Manual



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Norton Ohio 44203

Rev. 2/15

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1. System Overview

1.1. Tunnel Controller Signals Monitored by the 360-t

- **Conveyor Pulse: Input #1022**
Used to monitor conveyor speed. Bridge Forward Speed (toward the exit) is automatically adjusted to be equal to the conveyor speed.
- **Conveyor Entrance/Gate Photo Eye: Input #1023**
Used to determine vehicle length. Bridge Reverse Speed (toward the entrance) is automatically adjusted based on vehicle length & conveyor speed.
- **Conveyor Running: Input #1024**
Pauses the 360-t's tracking motion when the conveyor stops.

Note: These inputs use isolation (buffer) relays and are normally fed with external 24VDC power. Other relay coil voltages are optional.

1.2. Dedicated Tunnel Controller Output Signals Required by the 360-t

- **Start 360 (Extend and Enable): Input #1025**
Extends the wash arms to bay center and Enables the 360-t's tracking motion.
- **Start Top HP Pump: Input #1026**
Turns the Top HP Pump and Top Oscillator motors on.
- **Start Side HP Pump (Spray Arms): Input #1027**
Turns the Side HP Pump and Side Oscillator motors on.

****Note****

- When using the standard configuration where VFDs are used on the HP Pumps, the 360-t uses the Start Pump Signals from the tunnel controller to tell it when to turn the pumps on. The 360-t then uses Cat-5 Cables and Modbus communication signals to turn the pumps on and control their speed. The 360-t also turns on the oscillator motors at that same time.
- If no Top Washer exists and a Motor starter is used to run the Side (Wash Arm) HP Pump, the 360-t uses the Tunnel Controller Start Pump Signal to only turn the oscillator motors on. The Tunnel Controller is responsible for turning on the HP Pump

1.3. Vehicle Tracking Movement

The Accutrac 360-t uses electric gear motors to propel the Bridge and Trolley along their respective drive rails. The spray arms use pneumatic air cylinders to rotate toward the front, sides and the rear of the vehicle. When the Start 360 signal is received the Trolleys extend to the center and rotate to face the front bumper of the vehicle. As the vehicle approaches and blocks the first set of photo eyes on the T-bar (PE-1), the Bridge moves forward toward the exit, at the same time the Trolleys retract the Spray Arms. ***Note that if the Bridge moves too fast or the car stops (causing the PE-1 eyes to become clear) the Bridge and Trolleys will pause momentarily and wait for the vehicle before starting again.***

When the Bridge reaches the Exit end of the rail, the Exit proximity switch signals the Spray Arms to rotate toward the side of the vehicle. At the nearly the same moment, the Trolleys have reached their Retract proximity switches signaling the Bridge to begin moving rearward toward the wash entrance. Based on conveyor speed and vehicle length, the 360-t adjusts the speed so that the Bridge arrives at the Entrance end of the rail at the same moment the rear of the vehicle crosses it.

When the Bridge has reached the Entrance end of the rail, and the Entrance proximity switch, it waits a moment for the vehicle to move past the exit set of T-Bar photo eyes (PE-2). Once the vehicle has cleared the eyes the Spray Arms rotate toward the rear of the vehicle, the Bridge begins moving toward the exit while the Trolleys extend inboard. ***Note that if the Bridge moves too fast or the car stops (causing the PE-2 eyes to become blocked) the Bridge and Trolleys will stop momentarily and wait for the vehicle before starting again.***

When the Bridge reaches the Home proximity sensor at the middle of the main rails and the Trolleys have reached their Extend proximity sensors, the Bridge & Trolleys stop. After a brief pause for additional cleaning of the license plate area, the Spray Arms rotate 180 degrees back toward the entrance. The 360-t is now in its "Home" position and is ready to wash the next vehicle, waiting for the vehicle to block PE-1 and start the wash sequence again.

1.4. Vehicle Height Profiling

When normally equipped with a Top Washer, the 360-t uses four photo eyes (XP-1 thru XP-4), located on the T-bar poles, to read the vertical profile of a vehicle. Without the Top Washer, the 360-t has only one photo-eye (XP-3) for vertical profiling and is used for the Tall Vehicle Nozzle feature.

Whenever the 360-t is receiving a Top HP Pump Run signal and a Conveyor Running signal, the 360-t uses the XP photo eyes to determine the height of the vehicle and adjust the RPM of the Top 25Hp Pump so that the impact on the top of the vehicle remains constant. The spray impact on the hood of a car will remain the same as the impact on the roof of a full sized van.

The second height profiling feature of the 360-t is the T.V. (Tall Vehicle) Nozzle. The T.V. Nozzle is the top spray nozzle on each of the Spray Arms and these nozzles are turned on or off based on vehicle height. Portions of a vehicle that are taller than approximately 70" (enough to block either XP-3 or XP-4) will activate these nozzles. When these nozzles are turned on, the 360-t will also increase the RPM of the Side 25Hp Pump to keep spray pressure constant.

1.5. Oscillator Movement

When the 360-t receives a Top HP Pump or Side HP Pump run signal from the tunnel controller, it turns on the corresponding spray nozzle's Oscillator Motor. The 360-t continuously monitors conveyor speed and automatically adjusts the speed of the Oscillators such that the nozzle spray pattern hits every spot on the vehicle a minimum of two times.

1.6. Delay at Rear Timer

The 360-t has a built in Delay at Rear function. When the trolleys are extended washing the rear of the vehicle, there is a delay timer that can be configured by the user. It will keep the Spray Arms on the rear license plate area for a set time before rotating to wash the front of the next vehicle. A typical amount of delay time is 1.5 seconds; however, this can be set from 0.0 up to 3.0 seconds.

1.7. Pulse Initialization Procedure

The 360-t continuously and automatically adjusts its movement speeds based on the conveyor speed. It also needs to measure the length and monitor the position of each vehicle. In order to do this, it must accurately know the length of each conveyor clock pulse. To facilitate this, the 360-t has a Pulse Initialization Procedure built in. This is a semi-automatic procedure that measures and records the number of inches of travel each conveyor clock pulse represents. For additional information refer to the 360-t Start Up Manual.

1.8. Arm Rotate Air Valves & Cylinders:

With no power, Air valves provide full flow to the "A" ports (on top). Powering the valves, or pushing the red manual button on the valve, switches flow to the "B" ports (on the bottom or the solenoid end)

1. With no power, Inboard air cylinders are extended & Outboard cylinders are retracted. This makes the arms face the sides of the car.
2. Actuating the Arms **Front of Car** valve (on left) retracts the Inboard cylinder. With both cylinders retracted the Spray Arms face the front of the vehicle.
3. Actuating the Arms **Rear of Car** valve (on right) extends the Outboard cylinder. With both cylinders extended the Spray Arms face the rear of the vehicle

Note: Airline colors on cylinders: From In-board (center of bay) to Outboard: Clear, Blue, Translucent Blue, Black. Note DS & PS are mirror images.

1.9. Breakaway and Impact Sensors

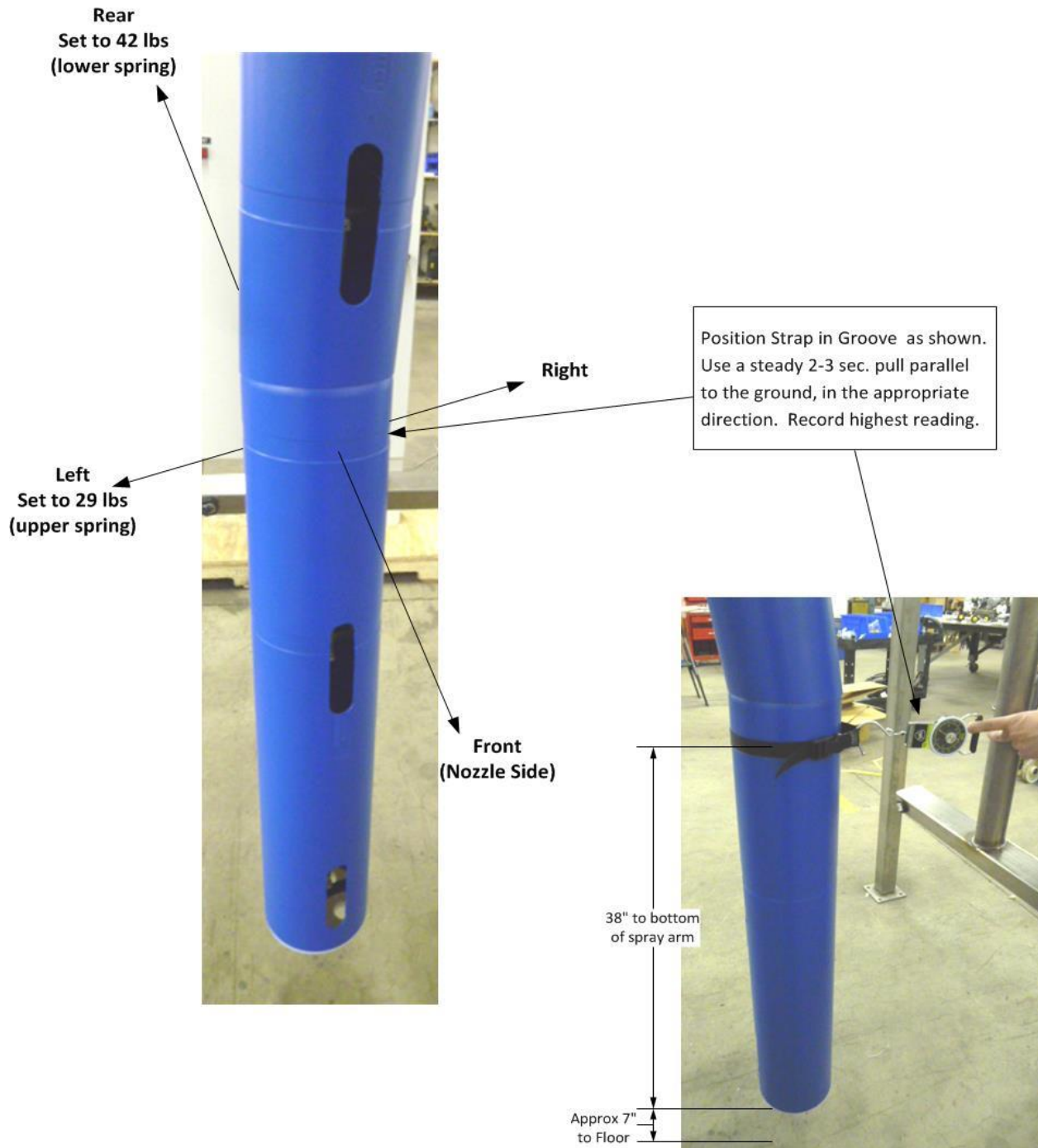
The 360-t Spray Arms have breakaways on them so if a vehicle hits a Spray Arm in either the forward/backward or left/right axis it will release and easily swing away. This motion actuates one or more of the impact sensors which will stop the 360-t and the conveyor movement. The Fault Indicator Light on the 360-t panel will illuminate and the fault will be displayed on the Touchscreen. The breakaways are spring loaded and will self-reset as soon as the spray arms are free to spring back to vertical. There are two elastomeric springs and two impact sensors on each spray arm. The springs must be set to the correct tension to prevent the force of the water spray from actuating an impact sensor. **Over tightening the spring will cause structural damage.**

Note: Refer to Figure 1 & 2 for illustration and the "Front" of a Spray Arm is defined as the spray nozzle side.

- A luggage scale or equivalent can be used to verify the spring heights below result in the correct breakaway force. **Over tightening the spring will cause structural damage.**
- Reference attachment point for checking the breakaway tension is 38" from the bottom of the spray arm.
- Upper Spring (Left/Right): Left breakaway force is factory preset to 29 lb.
- Lower Spring (Front/Rear): For shipping, lower spring pressure has been backed off. **Set Rear breakaway force to 42 lbs.**

There are two Impact sensors on each Spray Arm Breakaway. The sensor face must be adjusted to be flush with, or up to 1/32" recessed from the inside of the breakaway.

These impact sensors should be tested daily. To test them, wait until the wash is shut down, push each spray arm in both the forward/reverse and left/right directions until the yellow indicator light illuminates on the sensor itself. Then go to the HMI screen itself and there should be a fault listed for all 4 impact sensors.



NOTE:

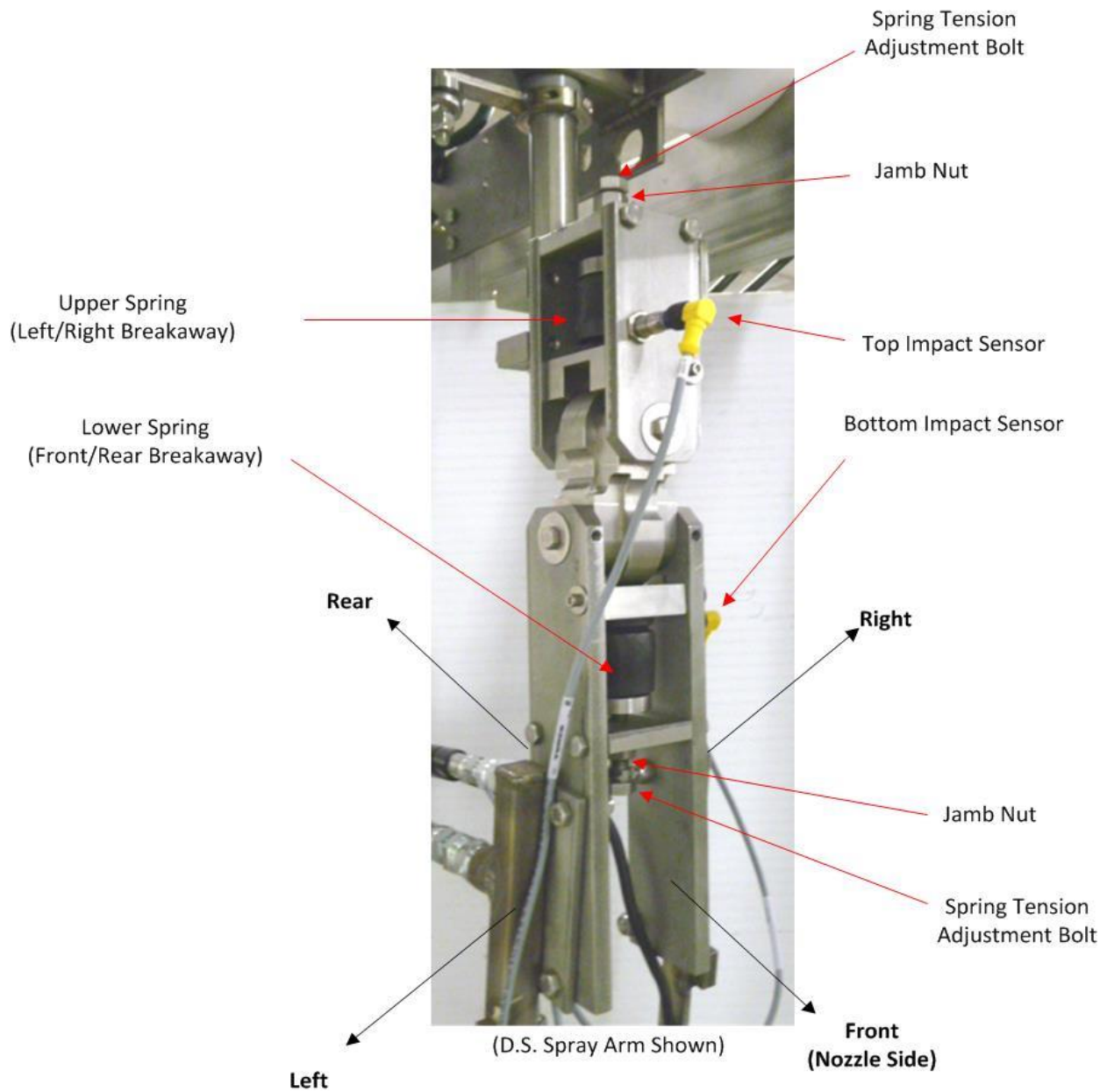
DO NOT SET BREAKAWAY FORCE IN FRONT OR RIGHT DIRECTION. Breakaway force toward the front (approx 24 lbs) is significantly less than toward the rear. Breakaway force toward the right (approx. 21 lbs) is also less than toward the left.

Breakaway Tension Measurement

Dwg./Part #:

Date: 8-24-12

Petit Auto Wash, Inc



Breakaway, Parts Identification
Dwg./Part #:
Date: 2/11/15
Petit Auto Wash, Inc

1.10. Machine Reset and Fault Relay

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Note: Solid red reset button indicates fault is present. Flashing indicates fault is removed and machine can be reset by pressing reset button.

When the 360-t senses a fault condition is present (i.e. Impact, Motor Run-on, etc.) the Fault Relay (output #0013) activates and shuts off the conveyor. The relay has a single set of N.O. and N.C. dry contacts and usually the conveyor stop is wired through the N.C. contacts. While a fault condition is present the panel fault/reset indicator light (and optional remote light) will remain illuminated. Once the fault is no longer present, the fault/reset indicator light begins to flash, indicating it can be reset. Pushing the reset button then clears the faults and homes the machine. If machine will not reset through the HMI (or there is a problem with the HMI), then cycling power to the PLC (CB-1) also will reset the machine.

Note: In the case of the Spray Arms being up against a vehicle and an impact sensor is on, the fault is present and indicator light will be on solid. Pressing the 360-t reset button will only cause the Trolleys to retract. When the Spray Arms clear the vehicle and the impact sensor is turned off, the fault indicator light will turn from solid to flashing. This indicates the fault has been removed and the machine is ready to be reset. The next push of the reset button will home the 360-t.

1.11. Photo Eye Inhibit Test

Whenever the 360-t reset button is pushed, and it completes a successful reset and re-home, the 360-t performs Photo eye inhibit test. The PE inhibit test verifies proper photo eye function by using Output #0015 to apply 24VDC (-) to all the white wires on the emitters. This inhibits all of the emitters' photo beams. The 360-t then watches the receivers for a transition from "On" to "Off" and back to "On". If one of the receivers does not turn "Off" during this test, or does not switch back "On" then the corresponding Fault is displayed onscreen.

Note: It's possible for one emitter to short internally and put 24VDC (-) to the white wires (beam inhibit). This will disable the entire bank of emitters. If this happens the Frequency select indicator will not be illuminated.

2. Troubleshooting Procedure

Safety note: Disconnect all power before servicing. VFDs are set to use continuous braking and therefore inject voltage even when motor is not moving.

2.1. Initial Check

- Verify the 360-t panel has power and that no circuit breakers are tripped.
- Check the touchscreen for any faults. Refer to Fault list for additional info.
- Check the 24VDC Power Supply. Verify the “DC On” (Green) light is on and the “DC LO” (Red) light is off.
- Verify the PLC has the following lights lit up. On the leftmost module of the PLC the “24V” and “OK” green lights should be on. On the next module the green “RUN” light should be on. There shouldn’t be any red lights illuminated on any of the modules.
- Verify that all VFD screens in the 360-t control panel read either “Rdy” or “Dcb” indicating they are receiving power and are not in a fault mode.
- If the problem is with the HP Pumps, verify that 25Hp HP VFDs are powered up and not faulted. The display normally shows “0.0” on the screen. Refer to section on HP Pump troubleshooting.

2.2. External Input Test

- Verify the actual conveyor speed is the same as that displayed on the touch screen. Using a stopwatch, time how long it takes for the conveyor to move 10ft. Divide the time by 10 to get the actual ft/sec speed and compare to value on main screen.
- Check the external inputs (isolation input relays)
 - Input #1022:** Conveyor Pulse Signal (verify signal is received at consistent intervals)
 - Input #1023:** Conveyor Entrance/Gate Photo Eye Signal (“On” when blocked by vehicle)
 - Input #1024:** Conveyor Running Signal (“On” whenever conveyor is running)
 - Input #1025:** 360 Start (Extend & Enable) Signal (“On” whenever vehicle is in the 360)

Note: These inputs need to be directly wired in parallel with each device. Do not use tunnel controller “Mirror” outputs as that would result in unreliable input timing and would cause the 360-t to malfunction.

Onboard Sensors List, 360-t

Sensor, Abrev. and Input #	Description	Location
Home Proximity Sensor HOME (1003)	30mm PNP Unshielded	DS Bridge End Plate, near Entrance. Target Flag is on the DS Bridge rail, near the middle.
Exit Proximity Sensor EXT (1004)	30mm PNP Unshielded	PS Bridge End Plate, near Exit. Target Flag is on the PS Bridge rail, near the Exit end
Entrance Proximity Sensor ENT (1005)	30mm PNP Unshielded	PS Bridge End Plate, near Entrance. Target Flag is on PS Bridge rail, near the Entrance end
DS Trolley Retract Proximity Sensor RETR (1009)	30mm PNP Unshielded	DS Trolley, on Outboard side. Target flag is on the Trolley Entrance rail near Outboard end.
DS Trolley Extend Proximity Sensor EXTD (1010)	30mm PNP Unshielded	DS Trolley, on Inboard side. Target flag is on the Entrance Trolley rail, near the Inboard end
DS Top Impact Proximity Sensor I-TOP (1011) **(Lft/Rt)	12mm PNP Shielded	DS Spray Arm Breakaway, Top sensor. Target is the Top Spring Pivot Arm.
DS Bottom Impact Prox. Sensor I-BOT **(Fr/Rr) (1012)	12mm PNP Shielded	DS Spray Arm Breakaway, Bottom sensor. Target is the Bottom Spring Pivot Arm.
PS Trolley Retract Prox. Sensor RETR (1013)	30mm PNP Unshielded	PS Trolley on Outboard side. Target Flag is on the Entrance Trolley Rail near the Outboard end.
PS Trolley Extend Prox. Sensor EXTD (1014)	30mm PNP Unshielded	PS Trolley on Inboard side. Target Flag is on the Entrance Trolley Rail near Inboard end.
PS Top Impact Proximity Sensor I-TOP (1015) **(Lft/Rt)	12mm PNP Shielded	PS Spray Arm Breakaway, Top sensor. Target is the Top Spring Pivot Arm.
PS Bottom Impact Proximity Sensor I-BOT **(Frt/Rr) (1016)	12mm PNP Shielded	PS Spray Arm Breakaway, Bottom sensor. Target is the Bottom Spring Pivot Arm.
Bridge Photo Eye #1 PE-1 (1007)	30mm PNP	Emitter at bottom of DS T-bar, Receiver at bottom of PS T-Bar (Both near Ent. Side and wired for Freq. "A")
Bridge Photo Eye #2 PE-2 (1008)	30mm PNP	Emitter at bottom of DS T-bar, Receiver at bottom of PS T-Bar (Both near Exit end and wired for Freq. "B")
Profile Photo Eye #1 XP-1 (1018)	30mm PNP	Emitter on DS T-bar pole, Receiver on PS T-bar pole (Both closest to the floor and wired for Freq. "B")
Profile Photo Eye #2 XP-2 (1019)	30mm PNP	Emitter on DS T-Bar pole, Receiver on PS T-bar pole (Both 2 nd from the bottom and wired for Freq. "A")
Profile Photo Eye #3 XP-3 (1020)	30mm PNP	Emitter on DS T-Bar pole, Receiver on PS T-bar pole (Both 3 rd from the bottom and wired for Freq. "B")
Profile Photo Eye #4 XP-4 (1021)	30mm PNP	Emitter on DS T-Bar pole, Receiver on PS T-bar pole (Both are at the top and wired for Freq. "A")
<p>Outboard is defined as outside of wash bay. Inboard is defined as center of wash bay **Front of a Spray Arm is defined as the side with the spray nozzles</p>		

2.3. 360-t Sensor Check

- Turn off the Bridge, DS Trolley, and PS Trolley VFD disconnects. Manually move the Bridge away from Home Proximity Target. **DO NOT PUSH ON THE T-BARS.** They are fastened with shear bolts that will give way.
- Manually move each Trolley to the center of its travel between the Extend and Retract Target Flags.
- Refer to the Input View Screen on the 360-t touchscreen by selecting the “Menu” button then “Input View” button. **NOTE:** Indicator lights on photo eyes and proximity sensors may or may not indicate correctly. **ALWAYS VIEW INPUTS ON THE TOUCHSCREEN.**
- Check the Photo Eyes:
Make sure Trolleys are retracted and Spray Arms are facing Inboard. (towards center of bay)
Verify signal is “On” when eyes are clear.
Verify signal goes “OFF” when eyes are blocked.

Note: All photo eyes are “Light operate” meaning the receiver’s output signal is “On” when it is receiving light from an emitter. Emitters are located on the Driver Side of the wash bay. Receivers are on the Passenger Side. Emitters are extremely powerful so it is best to check the output signal by blocking the Receiver. Also, it is possible for an emitter to be bad but its receiver may still be activated by light from another emitter. Receivers have a signal strength indicator ranging from 1 to 4. All receivers should show a signal strength of 4, the highest level. To help prevent crosstalk, the photo eyes use two different frequencies, “A” & “B”. The photo eyes are interchangeable because the frequency selection is made through hardwiring of the cord sets.

- Check the Proximity Sensors:
Signal should be “ON” when a metal target is placed within ¼” of the sensor face and “OFF” when target is removed.
- Check the 360-t Panel and Remote E-Stop buttons:
-Signal should be “ON”. E-Stop Switches are Push/Pull. Pushing opens the contacts and disables the 360-t. Pulling closes the contacts and enables the 360-t.
Note: If remote E-Stop is not used ensure 24VDC (+) jumper is installed on input #1029

2.4. Test Manual Output Overrides

Test the appropriate output related to symptoms

- Machine motion:
Verify the Bridge, Trolley or Spray Arm moves properly.
- TV nozzle:
Verify the TV solenoid is turning on.
- Pump outputs: (If controlled through 360-t Modbus)
Verify VFDs are responding to Modbus commands and functioning properly.

3. Troubleshooting Solutions

3.1. Incorrect Lights on 24VDC Power supply

- If no lights are on or if “DC Lo” Light (Red) is On:
Note: If the “DC Lo” Light is illuminated, there is a partial short to ground and the supply is limiting current output. If no lights are illuminated, then there’s a direct short to ground or supply is not receiving power
- Possible Internal Short- Bad 24VDC Power Supply:
 Verify CB-3 is ok and check for 120VAC input to the supply.
 Find wire #1 in the gray 25 conductor Control cable and remove it from 24VDC terminal. If “DC On” (Green) Light turns on then the short is on the 360-t bay equipment or wiring. If “DC Lo” light is still illuminated then remove 24VDC output wires from the Power Supply. If “DC On” still doesn’t illuminate then replace the Power Supply. Return all wires to original terminals.
- Possible External Short- Cord set/Photo Eye/Proximity Sensor shorted:
 Go out to each of the 2 Trolley junction boxes (DSTC/PSTC), the 2 Sensor Array boxes (DSSA/PSSA), and the Bridge Junction Box. Remove wire #1 in the multi-conductor cable (24VDC+), one at a time until “DC On” light is illuminated. Once you have it narrowed down to one box, land the #1 wire back on 24VDC, then narrow it down further in the same manner to a specific cord set or sensor. Replace the damaged device. If the short still exists after this process, suspect the multi-conductor cable for an internal short.

3.2. Input Problems (No signal, or signal stuck on)

- Photo Eyes:
 If Xp-3 only is blocked verify the Spray Arm hoses are routed properly. The two hoses should follow their natural curve and not be bound up. If not, XP3 can be blocked at certain positions.

Photo eyes out of alignment. T-Bars are not parallel to each other or bent mounting bracket. Mounting holes may be large enough to allow some adjustment.

- Faulty emitter or receiver
- Faulty cord set (shorted or open)
- Water in junction box
- Poor connection (corroded terminals/ improperly stripped wires etc.)

Note: It’s possible for one emitter to short internally and put 24VDC (-) to the white wires (beam inhibit). This will disable the entire bank of emitters.

- Proximity Sensor
 - Verify correct adjustment. Face of 30mm proximity sensor to be 3/16” to 1/4” from target flag. Face of 12mm Impact proximity sensor to be flush with, or up to 1/32” recessed from the inside of the breakaway.
 - Faulty sensor
 - Faulty cord set (shorted or open)
 - Water in junction box
 - Poor connection (corroded terminals/ improperly stripped wires etc.)

3.3. Output Problems (Verified during manual control override)

- If one Spray Arm air cylinder will not rotate
 - Ensure rod ends are not binding. Loosen the jamb nut and see if rod end will swivel up and down by hand. If not replace it.
 - Verify the air cylinder are not binding. Shut off air flow to solenoid valves. Rotate the Spray Arms by hand. If not able to move by hand then remove and replace the air cylinder.
 - If Spray Arm air cylinders will not rotate
 - Verify air supply is set to 70 to 85 psi.
 - Check air solenoid valves by pushing red override button on valve itself.
(Output #0010 Rotate towards front of Vehicle, #0011 Rotate towards rear of vehicle)
 - Check wiring to air solenoids.
- Verify correct plumbing of quad-tubing air lines from valves to cylinders (refer to installation documents)

Note: It is possible, with extreme wear on rod ends and loose or worn mounting bolts for the air cylinder to get flipped to the opposing side and jam into the trolley undercarriage during extension. In which case remove the cylinder, replace the worn components and realign the air cylinder correctly. Refer to air cylinder replacement procedure.

- 360-t Drive Motor (Bridge, Trolley, or Oscillator) VFD Problems
 - If the VFD screen flashes during override then the VFD is limiting current to prevent overloading. There may be a mechanical binding problem.
 - Refer to Fault list for troubleshooting info for each fault.
- To check motor windings, remove all power coming into the motor (U, V, W). Check the resistance value across each of those legs on the motor. Values should be within 5% of each other. Typical resistance values are 19.5Ω (+- 1Ω) for 1/4 Hp drive motors and 76Ω (+- 3.8Ω) for 1/15 Hp Oscillator motors. This is across T1/T7 to T2/T8, T2/T8 to T3/T9 and T1/T7 to T3/T9 or U to V, V to W, and U to W. Each leg should also be checked to ground to ensure the motor insulation is not damaged or shorted to the case.
- Spray Arms move excessively during wash:
 - Verify correct spring tension using scale as listed above in Operations.
 - Possible Breakaway bushings are worn, and need replaced.
- HP pump VFD does not run:
 - Check that the Modbus Enable button has been selected on touchscreen.
 - Test the Cat5 ethernet communication cable for correct order with proper cable tester. (Refer to wiring schematics & T568B Protocol)
 - Check proper incoming voltage on all three legs.
 - Verify that the VFD is programmed correctly, refer to the VFD Parameter document.

3.4. Variable Frequency Drive Faults

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- **OCF – Over Current Fault**
 - Direct short/bleed over from corroded terminals or wire sheath cracking
 - Water in junction boxes
 - Perform resistance test on motor windings

- **OLF – Motor Overload Fault**
 - Motor has reached the thermal protection limit

- **SCF – Short Circuit Fault**
 - Short/Bleed over of voltage at Drive output/Motor
 - Water in junction boxes
 - Perform resistance test on motor windings

- **PHF – Input Phase Loss**
 - Loss of one leg of power coming into the Drive

- **OPF – Output Phase Loss**
 - Loss of one leg of power at Drive output/Motor
 - Poor connection at Drive output/Motor

- **USF- Under voltage**
 - Insufficient Line supply into drive (Less than 160v on 220v system)

- **SLF – Modbus Failure**
 - Communication failure on Modbus line
 - check Cat5e cable

- **ERR5- Communication Loss**
 - Loss of Modbus Communication (not available until successful initial run command of pump has been received)

- **OHF- Drive Overheat**
 - Ambient temperature too high, venting problems
 - Allow drive to cool before restarting

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- **EPHO – Output Phase Loss**
 - Loss of one leg of power at Drive output/Motor
 - Poor connection at Drive output/Motor
- **EPHI – Input Phase Loss**
 - Loss of one leg of power coming into the Drive
- **OH – Drive Over temperature**
 - Ambient Temp is too high or Drive cabinet venting problem
 - Drive cooling fan is inoperative
- **UPI – Under voltage**
 - Input voltage has dropped below threshold
- **OL2 – Motor Overload**
 - Motor is locked up or has excessive load applied

Common Accutrac 360 Resistance Values

Name/Location	Technical info/Resistance Value +/- 10%
Solenoid Coils	
Dema Rocket Chemical Injector/FDM	24VAC/20.6 Ohms
MFD Air Solenoid Valve Bank/FDM	24VAC/50.0 Ohms
ASCO Solenoid Valve/Legacy FDM	24VAC/21.1 Ohms
DEMA 474 Solenoid Valve/FDM	24VAC/7.6 Ohms
Electric Motors	
1/15 Hp Oscillator Motor/Spray Arms	208VAC/75.5 Ohms
1/4 Hp Drive Motor/Bridge & Trolley	208VAC/19.5 Ohms
25 Hp Pump Motor/High pressure pump	208VAC/.05 Ohms (460V/.25 Ohms)

4. 360-t Fault Codes

Fault	Description
Bridge FTR	Bridge motor Failed To Run
Bridge Prox Not Found	Failed to see Bridge Prox. "ON" after 110 seconds of Bridge run command
DS Osc FTR	DS Oscillator motor Failed To run
DS Trolley Prox Not Found	Failed to see DS Trolley Prox. "ON" after 17 seconds of Trolley run command
Impact DS Top	DS Top Impact (left/right) Sensor has tripped
Impact DS Bottom	DS Bottom Impact (Front/Rear) Sensor has tripped
DS Trolley FTR	DS Trolley motor Failed to Run
HP Pump Side FTR	Side HP Pump Failed to Run
HP Pump Top FTR	Top HP Pump Failed to Run
ESTOP	360-t Panel E-Stop is pushed/open
PE1 Fail	PE1 did not make the on/off/on transition during PE Inhibit test
PE2 Fail	PE2 did not make the on/off transition during PE Inhibit test
PS Osc FTR	PS Oscillator Motor Failed to Run
PS Trolley Prox Not Found	Failed to see PS Trolley Prox. "ON" after 17 seconds of Trolley run command
Impact PS Top	PS Top Impact (left/right) Sensor has tripped
Impact PS Bottom	PS Bottom Impact (front/rear) Sensor has tripped
PS Trolley FTR	PS Trolley Motor has Failed to Run
Pulse Setup Failed	Pulse Initialization Setup has failed
Remote ESTOP	Remote E-Stop button is pushed/open
Top Osc FTR	Top Oscillator Motor Failed to Run
XP1 Fail	XP1 did not make the on/off/on transition during PE Inhibit test
XP2 Fail	XP2 did not make the on/off/on transition during PE Inhibit test
XP3 Fail	XP3 did not make the on/off/on transition during PE Inhibit test
XP4 Fail	XP4 did not make the on/off/on transition during PE Inhibit test